Amendments to the Claims

The listing of claims will replace all prior versions, and listings of claims in the application.

1. (currently amended) A method of discrete multitone transmission of bits making up a plurality of frames<u>, wherein each frame includes a plurality of frame bit positions,</u> including:

allocating a respective number of bits to each of a plurality of discrete tones;

assigning the bits of each frame to the <u>plurality of</u> discrete tones such that each discrete tone is assigned the allocated respective number of bits and wherein [[the]] <u>a</u> permutation mapping the bits of each frame to each of the discrete tones cycles through a sequence of different permutations in successive frames<u>, wherein a bit in a frame bit position is mapped to a different discrete tone in a plurality of successive frame assignments</u>;

generating for each frame a symbol comprising a plurality of discrete tones modulated to transmit the bits assigned to the respective tones; and

transmitting the generated symbols.

2. (canceled)

3. (original) A method of data transmission according to claim 1 wherein a predetermined cyclic sequence of permutations is used in successive frames.

4. (original) A method of data transmission according to claim 1 wherein there are n discrete tones, where n is an integer;

the ith tone is allocated to transmit b(i) bits, where b(i) is an independent positive integer for each of the n tones; and

in the jth frame each consecutive $b(n_{jk})$ bits starting from the first bit of the frame are assigned to the n_{jk}th tone in sequential order as k increases from 1 to n, where $[n_{j1}, n_{j2}, n_{j3}, \ldots n_{jn}]$ is a permutation of the first n positive integers [1, 2, 3 . . . n].

5. (original) A method of data transmission according to claim 4 wherein the sequence of permutations cycles from an initial permutation through all possible permutations of the first n integers [1,2,3 . . . n] in successive frames before returning to the initial permutation to commence the cycle again.

6. (currently amended) A method of data transmission according to any preceding claim including:

for each of the discrete tones, generating for each frame an amplitude phase keyed constellation point representing the bits allocated to the tone; and

using an inverse discrete Fourier transform to generate a transmitted output signal from the amplitude phase keyed constellation points.

7. (original) A method of data transmission according to claim 6 wherein the amplitude phase keyed constellation points are quadrature amplitude modulation constellation points.

8. (original) A method of data transmission according to any preceding claim wherein the bits are trellis coded.

9. (currently amended) A discrete multitone modem for transmitting a stream of bits making up a plurality of frames, wherein each frame includes a plurality of frame bit positions, comprising:

a tone generator for assigning the bits in each frame to a plurality of discrete tones such that each discrete tone is allocated a predetermined respective number of bits, wherein [[the]] a permutation mapping the bits of each frame to each of the discrete tones cycles through a sequence of different permutations in different frames, wherein a bit in a frame bit position is mapped to a different discrete tone in a plurality of successive frame assignments;

a constellation point generator for generating a constellation point for each tone representing the assigned bits; and

an inverse discrete Fourier transform module for generating an output signal including [[a]] the plurality of discrete tones from the constellation points.

10. (original) A discrete multitone modem according to claim 9 for use with n discrete tones, where n is an integer, wherein

the tone generator includes a bit allocation table allocating b(i) bits to the ith tone, where b(i) is an independent positive integer for each of the n tones; and

the tone generator assigns in the jth frame the first $b(n_{j1})$ bits of the bit stream to the n_{j1}th tone, and each subsequent $b(n_{jk})$ bits are assigned to the n_{jk}th tone in sequential order as k increases from 1 to n, where $[n_{j1}, n_{j2}, n_{j3}, \ldots n_{jn}]$ is a permutation of the first n positive integers [1, 2, 3 . . . n].

11. (original) A discrete multitone modem according to claim 10 wherein the sequence of permutations cycles from an initial permutation through all possible permutations of the first n integers [1, 2, 3 . . . n] in successive frames before returning to the initial permutation to commence the cycle again.

12. (currently amended) A method of receiving data divided into frames, the data being generated by assigning the bits of a bit stream, having a plurality of frames, ~~of each frame~~ to discrete tones and mapping the bits of each frame to the discrete tones by cycling through a predetermined sequence of different permutations in successive frames; wherein the method includes the steps of:

receiving a sequence of symbols, each symbol frame including a respective number of bits on each of a plurality of discrete tones;

decoding the received symbols according to the predetermined sequence of different permutations to regenerate the bit stream, wherein the predetermined sequence of different permutations maps a bit in a frame bit position to a different discrete tone in a plurality of successive frames. ~~transmitted bits~~ [[; and]]

~~inverting the predetermined permutation corresponding to each frame to regenerate the transmitted bits of the frames.~~

13. (original) A method according to claim 12 wherein there are n discrete tones, where n is an integer, the ith tone being allocated to transmit b(i) bits, where b(i) is an independent positive integer for each of the n tones; the method comprising the steps of

obtaining for each frame (j) the permutation $[n_{j1}, n_{j2}, n_{j3}, \ldots n_{jn}]$ of the first n positive integers [1, 2, 3 . . . n], and

regenerating the frame by taking the first $b(n_{j1})$ bits of the frame from the decoded n_{j1}th tone, and the subsequent bits in order from the decoded n_{j2}th tone, the n_{j3}th tone until the last bits are taken from the n_{jn}th tone.

14. (currently amended) A discrete multitone modem for receiving a stream of symbols representing a plurality of frames, comprising:

a discrete Fourier transform module for generating constellation points corresponding to <u>a plurality of</u> discrete tones contained in each received symbol; <u>and</u>

a tone decoder ~~for~~<u>, wherein the tone decoder is configured to decode the received symbols according to a predetermined sequence of different permutations to regenerate an original bit stream,</u> ~~making up a frame~~ <u>wherein:</u>

~~such that~~ each discrete tone is allocated <u>a</u> [[the]] respective number of bits,

~~wherein~~ the allocation of bits to discrete tones cycles through [[a]] <u>the predetermined</u> sequence of different permutations<u>, and</u>

<u>the predetermined sequence of different permutations maps a bit in a frame bit position to a different discrete tone in a plurality of successive frames.</u> ~~in different~~

~~frames, and for generating a constellation point representing the allocated bits for each tone; and~~

~~an inverse discrete Fourier transform module for generating an output signal including a plurality of discrete tones from the constellation points.~~

15. (currently amended) A method of data transfer of bits of a bit stream making up a plurality of frames across a link, wherein each frame includes a plurality of frame bit positions, comprising:

allocating a respective number of bits to each tone;

assigning the bits of each frame to the plurality of discrete tones such that each discrete tone is assigned the allocated respective number of bits, wherein [[the]] a permutation mapping the bits of each frame to each of the discrete tones cycles through a sequence of different permutations in successive frames, wherein a bit in a frame bit position is mapped to a different discrete tone in a plurality of successive frame assignments;

generating for each frame a symbol comprising a plurality of discrete tones modulated to transmit the bits assigned to the respective tones;

transmitting the generated symbols across a link;

receiving the transmitted symbols from the link; and

decoding the received symbols according to the predetermined sequence of different permutations to regenerate the bit stream.~~transmitted bits in each tone~~; ~~and~~

~~inverting the mapping of bits to tones corresponding to each frame to regenerate the original frames from the decoded bits of each tone.~~

16. (original) A method according to claim 15 wherein there are n discrete tones, where n is an integer, the ith tone being allocated to transmit b(i) bits, where b(i) is an independent positive integer for each of the n tones; and

the step of mapping tones to bits assigns in the jth frame the first $b(n_{j1})$ bits of the frame to the n_{j1}th tone, and each subsequent $b(n_{jk})$ bits are assigned to the n_{jk}th tone in sequential order as k increases to n, where $[n_{j1}, n_{j2}, n_{j3}, \ldots n_{jn}]$ is a permutation of the first n positive integers [1, 2, 3 . . . n].